Geophysical Research Abstracts
Vol. 21, EGU2019-4011, 2019
EGU General Assembly 2019

Quantifying source-specific sediment fluxes in rehabilitating catchments in the Lake Tana Basin of northwest Ethiopia

Habtamu Assaye (1,2), Samuel Bodé (3), Alemayehu Wassie (2), Derege Meshesha (2), Enyew Adgo (2), Jean Poesen (4), Jan Nyssen (1), Pascal Boeckx (3), Amaury Frankl (1,5)

(1) Ghent University, Faculty of Sciences, Geography, Belgium (habtamuassaye.deffersha@ugent.be), (2) Department of Natural Resource Management, Bahir Dar University, Bahir Dar, Ethiopia, (3) Department of Green Chemistry and Technology, Ghent University, Ghent, Belgium, (4) Department of Earth and Environmental Sciences, KU Leuven, Heverlee, Belgium, (5) Research Foundation Flanders (FWO), Brussels, Belgium

The Lake Tana Basin suffers from soil erosion and sediment fluxes to the Lake threatens its ecology and storage capacity by siltation. Soil erosion control measures are often not successful as upland erosion processes and sediment sources are not properly understood. In this study, we aimed at understanding sediment sources and fluxes by integrating fingerprinting and catchment sediment yield measurements. As a proof of concept, we selected two small catchments (60 ha and 76 ha) within a 10.4 km^2 study area near the town of Arb Gebeya. At the outlets, sharp-crested rectangular weirs were installed to quantify runoff and suspended sediment fluxes. Therefore, the water stage was measured at the weirs at five-minute interval using a TD-Diver and suspended sediment was sampled in the morning and during peak runoff events. Phillips tube sediment samplers were also installed at the catchment outlets to collect time-integrated sediment samples. Within the two catchments, 75 soil samples were collected from five land use classes and gully banks. A compound specific stable isotope (CSSI) finger printing technique was used to apportion sediment sources using δ13C of plant derived fatty acids (δ13C–FAs). Gas chromatograph-combustion-isotope ratio mass spectrometry (GC-C-IRMS) was used to measure this isotopic signature and MixSIAR, a FA-content dependent, Bayesian-stable isotope mixing models was used to determine the proportional contribution of the different sediment sources to the sediment mixture. Finally, source-specific catchment sediment budget was determined and sediment fluxes were analyzed in relation to catchment connectivity. Primary results revealed that percent vegetation cover of a catchment strongly influences runoff and sediment yield processes.

Keywords: Catchment, land uses, connectivity, fingerprinting, sediment yield